Economic Impact of Reductions in Universal Service Fund and Intercarrier Compensation Revenues to Chariton Valley Telephone Corporation

Introduction

The Bureau of Economic Research at Missouri State University conducted a study to determine the potential economic impact on the Chariton Valley Telephone Corporation and the local/statewide economy of Federal Communications Commissions' (FCC) changes to important regulatory structures. This study focuses on the changes in the distribution of Universal Service Funds (USF) and the reductions in Intercarrier Compensation (ICC) that the FCC has ordered. The Bureau of Economic Research combined data collected from Chariton Valley Telephone Corporation (Chariton Valley, CV, or CVTC) with data from the FCC, Bureau of Economic Analysis, and the Census Bureau to formulate an economic model of the local and statewide economy. This model was used to determine the impact on employment, output, and taxes would be.

This report is outlined in the following manner: The first section provides background information on the changes in USF and ICC the FCC has ordered. The second section discusses the demographics of CV's service area, and how its characteristics impact the cost of telephone service. The third section examines the data collected and the methodology used. The fourth section measures the economic impacts.

Background and FCC Ordered Changes to USF and ICC

The telecommunications industry in the United States is large and growing in importance. In 2009, the industry had revenues of nearly $285 billion, employed over 1 million people, and completed over 235 billion switched calls.[1] Of this $285 billion in revenues, $112 billion comes from local service, $121 billion for wireless service, and the remaining $52 billion for toll service. This industry has seen significant growth over the past few years. In 1996 the telecommunications industry had revenues of $222 billion, suggesting that revenues have increased 28% between 1996 and 2009. In 1996 Congress passed the 1996 Telecommunications Act, which was the first major overhaul of the Communications Act of 1934. The 1996 Telecommunications Act had several major goals, including continued pursuit of parity of rural services and rates to urban services and rates.[2] Continued pursuit of universal service was implemented via Universal Service Fund (USF) which is now administered by the Universal Service Administrative Company (USAC); and via Intercarrier Compensation (ICC). Intrastate ICC was

[1] FCC, Trends in Telephone Service, September 2010, Tables 5.1, 10.2, 15.1, 2009 data (preliminary). The number of cellular-to-cellular phone calls was not available.
[2] FCC, The Telecommunications Act of 1996, http://transition.fcc.gov/telecom.html

administered by state public utility commissions. Interstate ICC was administered by the FCC.

Universal Service Fund

The USF is funded by fees imposed upon carrier interstate and international service revenues. This funding is collected by telephone companies (that pass these fees on to their customers) and remitted to USAC. These dollars are then distributed to eligible telecommunications carriers via the USF's four subprograms:: High Cost, Low Income, Rural Health Care, and Schools and Libraries.[3] In 2010, USAC distributed $7.95 billion via these four subprograms.

The High Cost program helps to ensure that consumers across the country pay rates for telephone and information service that are comparable to those available in urban areas. High Cost program receipts mitigate the higher costs and lower population densities rural providers have in serving rural areas. This program is the largest source of USF funds, disbursing $4.27 billion in 2010 with average dollar/line support at $9.75 and median dollar/line support at $1.56.

The Low Income program aids low-income consumers who otherwise might not be able to afford telephone service. In 2010 over 10.5 million households received the benefits of this program with disbursements of $1.32 billion.

The Rural Health care program supports telephone and internet access service to rural health care providers, aiding in the creation and support of advanced rural networks for telemedicine. Over 3,000 health care providers receive this support yearly. In 2010 disbursements amounted to $86 million.. The Schools and Libraries program, or the 'E-Rate' program, provides discounted telephone service, internet access, and financial aid for maintenance and internal connections within schools and libraries in all 50 states and US territories. In 2010 the E-Rate program disbursed $2.28 Billion to over 22,000 Schools and Libraries.

The November 2011 FCC Order directed that USF be retargeted from supporting telecommunications services toward supporting broadband access. Numerous programmatic changes were made to USF by the FCC. These changes reduced the amount of USF revenues that will be directed to companies serving predominantly rural areas. The FCC Order also directed reductions or eliminations of ICC.

Intercarrier Compensation

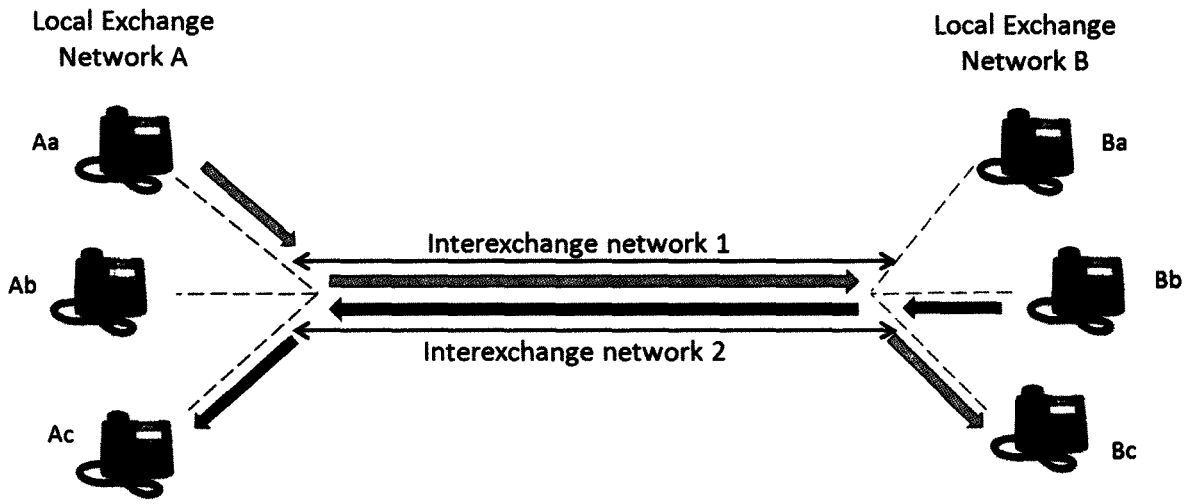
[3] Universal Service Administrative Company, 2010 Annual Report, http://www.usac.org/about/governance/annual-reports/2010.html

ICC is payment from one carrier to another carrier for the first carrier's use of the second carrier's network to make a call. Today's ICC was adopted after the 1984 break-up of AT&T. In 1984, AT&T monopolized 80% of interstate access minutes resulting in the collection of 90% of all interstate revenues. AT&T also owned or controlled 75% of local telephone service.[4] ICC includes access charges for originating or terminating long distance calls; and reciprocal compensation for terminating local calls. These are typically called *inter*state and *intra*state ICC respectively. Interstate ICC is regulated by the FCC, while Intrastate Intercarrier Compensation is regulated on a state-by-state basis by state public utility commissions.

A few examples will help illustrate the mechanics and economics of how ICC works. Assume a household A makes a call from St. Louis, Missouri (AT&T) to a business B located in Salisbury, Missouri (CVTC). AT&T pays CVTC ICC for the use of CVTC's network to complete the AT&T customer's call. If local business B calls household A, then CVTC would pay AT&T ICC for use of AT&T's network to complete the CVTC customer's call. Diagram I illustrates:

Diagram I. Intercarrier Compensation Illustrated

[4] Zolnierek, J., Rangos, K. and Eisner, J. *Long Distance Market Shares Fourth Quarter 1998*, FCC, Industry Analysis and Technology Division, 1999.
http://transition.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/mksh4q98.pdf



In this illustration, there are two local exchange networks, A and B, and two interexchange networks, 1 and 2. Each local exchange consists of customer access lines, the dashed colored lines, which connect the local customers. Local exchange network A has customers Aa, Ab, and Ac. Local exchange network B has customers Ba, Bb, and Bc. Suppose that household Aa originates a call to household Bc via interexchange network 1 (orange arrows) and that household Bb originates a call to Ac via interexchange network 2 (purple arrows). In this case, the lines and switches of local exchange networks A and B, and interchange network of 1, are needed to complete the first call. Similarly, the lines and switches of local exchange networks A and B, and interchange network of 2, are needed to complete the second call. Under both of these circumstances, costs are incurred for both local exchange networks A and B, and both interexchange networks 1 and 2.

The Supreme Court has ruled that the need for the lines and switches of local telephone exchanges to complete interstate or intrastate telephone calls was obvious, and the FCC and states must separate and account for these costs.[5] From an economic standpoint, costs are incurred for both local exchange networks A and B despite the fact that calls might not have originated within their local exchange. Once again, consider the first call (orange). The call originates at location Aa, travels over local network A, travels over interexchange network 1, travels over local network B, and terminates with customer Bc. Had any of these local or interexchange networks not been in place, the phone call could not have been completed.

Each local network provider has to maintain its lines and switches in order to originate and terminate calls. These costs include not only the labor and supplies necessary to maintain lines and switches, but also include the large sunk and fixed costs of installing the telephone lines in the first place. It is well recognized that costs for

[5] *Smith v. Illinois Bell Tel. Co.*, 282 U.S. 133, 1930.

expensive fixed assets are recoverable under either long time periods of operation or by the firm producing large amounts of output from the fixed asset. Under the scenario of a Local Exchange Carrier (LEC) that might not be subject to heavy calling volume, they would need long periods of time and/or higher usage rates in order to recover these costs. ICC has been a substantial component of rural LEC revenue relied upon for cost recovery. If regulation is changed that makes recovery of network investments impossible or unlikely, the LEC would undoubtedly, in the best case scenario, cease any further expansion of its network. In a worst case scenario it might be forced into insolvency.

The November 2011 FCC Report and Order of Further Notice of Proposed Rule Making (FNPRM) made dramatic changes to ICC.[6] The FCC has ordered immediate reductions to state and interstate ICC rates. In addition the FCC has ordered a gradual elimination of ICC with ultimate replacement by a system of uncompensated use of networks by other carriers, knows as Bill-and-Keep (BAK). Under BAK carriers are only permitted to bill their end-user customers in order to obtain sufficient revenues to cover the costs of establishing and maintain their network. Specifically, the FCC wants to

- Require carriers to cap ICC rates as of the effective rule dates and to reduce to parity all intrastate and interstate ICC rates by July 2013
- Transition to BAK within 6 years for price cap carriers and within 9 years for rate-of-return carriers
- Allow ILECs to charge a small Access Recovery Fee (ARC) on wireline service. However, this charge is limited to $0.50 per month, can only increase at the rate of $0.50 per month per year, and cannot be assessed on customers whose total monthly rate of telephone service is greater than $30 per month. The FCC expects that "the actual average increase across all wireline consumers to be no more than $0.10-$0.15 a month, which translates into an expected maximum of $1.20-$1.80 per month".[7]
- However, the FCC expects the ARC to "phase down over time as carriers' eligible revenue decreases, and we prevent carriers from charging any ARC on Lifeline customers..."[8]

One goal of the FCC is to make local subscribers pay for the network of their provider. A secondgoal is ensuring that subscriber's bills do not rise to an unreasonable

[6] http://www.fcc.gov/document/fcc-releases-connect-america-fund-order-reforms-usficc-broadband
[7] *FNPRM*, FCC, 11-161 (rel. Nov. 18, 2011), ¶ 36.
[8] Ibid, ¶ 36.

level.[9] These goals are not compatible for rural local exchange companies such as CVTC. Due to the higher costs of its rural network, less usage with fewer subscribers, and fewer subscribers to pay for CVTC's network, it is highly unlikely if not impossible for both goals to be met. Chariton Valley provides service to an area that has a relatively low population density with subscribers who have relatively low incomes. The low population density means that Chariton Valley faces higher average costs to provide telephone and broadband service. The small number and low incomes of its consumers means that it lacks the ability to 'pass these higher network costs' to its subscribers. This constrained ability to pass higher costs to customers comes from both the proposed new regulatory framework and from simple economics. Loube and Pilalis (2011) sum up the situation succinctly when they state,

> "Some local networks are more costly to maintain than others. For the more costly networks, costs cannot always be recovered solely from subscribers without violating universal service principles. Therefore, intercarrier compensation revenues, USF revenues, or both are required to keep these access networks functioning and expanding their capacity to meet future increases in access traffic demand."[10]

Study Area

This report analyzes the economic impact of the FCC's NPRM and the FNPRM on Chariton Valley Telephone Corporation. The economic impact of USF/ICC changes was analyzed at the county level within the counties in which it had operations. Currently Chariton Valley provides service to subscribers in eight counties in North Central Missouri: Carroll, Linn, Macon, Randolph, Chariton, Shelby, Monroe, and Livingston. Chariton Valley Telephone Corporation's actual service area is smaller than these 8 counties. However, the county level was the smallest jurisdiction which would have consistent and reliable data for purposes of detailed analysis and forecasting. [11] Therefore, the term 'Chariton Valley study area' refers to the counties and not the actual service area, unless otherwise noted. Figure 1 shows the area of impact in the study.

These counties tend to be rural and poorer compared to the rest of the state as illustrated by Figures 2 thru 5. The counties that are hatched on the map are the counties

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[9] These two ideas are, of course, contradictory. One cannot logically create a policy where party A is forced to pay more for a product or service with the goal that the price that party A pays for the product or service does not increase. By definition an increase in costs leads to an increase in price.

[10] Loube, Robert, and Labros Pilalis, "Intercarrier Compensation: A White Paper to the State Members of the Federal-State Joint Board on Universal Service", February 7, 2011. http://www.kcc.state.ks.us/telecom/roundtable032011/Intercarrier_Compensation_White_Paper.pdf

[11] Although there is data at the city level, none of this data would be available, consistently and reliably, for the communities served by the Chariton Valley Telephone Corporation. These communities are simply too small.

in the area of study. These counties constitute 7.3% of the state's land area but only contain 1.6% of the state's residents who earned less 1.4% of the state's total personal income. This translates into a population density for the counties touched by Chariton Valley of only 20 people per square mile. For comparison, the counties that make up the Kansas City, Missouri Metropolitan Statistical Area (MSA) has a population density of 237 people per square mile.[12] The St. Louis MSA's population density is 437 people per square mile.[13] When one just examines the cities themselves, the population density rises dramatically. Once again, even though Chariton Valley provides services in an 8 county area, they do not service the entire area of these counties. Therefore, they must provide phone service to an area that has a residential customer density level of only 4 people per square mile. Table 1 compares the population density of the Chariton Valley service area to some common cities and regions. This table shows how difficult and expensive the servicing of customers with phone and broadband service can be for Chariton Valley.

Table 1. Population Density (People/Sq. Mile) of Selected Areas

Area	Population Density
Manhattan, NY	70,951
Washington, D.C.	10,065
St. Louis, Mo.	4,823
Kansas City, Mo.	1,630
Contiguous US	95
Missouri	80
Eight County Region of Study	20
CV Actual Service Area	4

An alternative method to examine the economic conditions in the study area is to note that the average weekly wage was $592 which is 32% less than the US average.[14] The Chariton Valley study area's wages are also lower than the other two primary Metropolitan Statistical Areas (MSA) in the state—Kansas City and St. Louis which are $854 and $863 respectively. Therefore, residents of the Chariton Valley study area have wages that are approximately 31% smaller than in the primary cities.

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[12] The Missouri counties that make up the Kansas City, Missouri MSA are: Bates, Caldwell, Cass, Clay, Clinton, Jackson, Lafayette, Platte, and Ray. Interestingly enough, the area of the counties of the Kansas City MSA is roughly equal to the area of the counties touched by Chariton Valley service; however, these counties only have 1/10th the population of the Kansas City MSA.

[13] The Missouri counties that make up the St. Louis, Missouri MSA are: Franklin, Jefferson, Lincoln, St. Charles, St. Francois, St. Louis, Warren, Washington, and the city of St. Louis itself.

[14] Bureau of Economic Analysis, State and Local Personal Income, http://www.bea.gov. This is a county population weighted average of county level weekly wages for the Chariton Valley Study area. The US figure excludes Alaska and Hawaii. The weighted average weekly wage for the contiguous United States is $861. The unweighted average weekly wage for the Chariton Valley study area is $579 which is 40% below the unweighted US average weekly wage rate.

Low Density = High Cost and Low Wages = Low Demand

For areas with low population densities, the average cost per customer of providing services requiring distribution facilities (such as telephone, water, electricity, natural gas, etc.) is high. This is not merely a function of economies of scale whereby average production costs decrease as the quantity produced increases. As there are fewer people per mile, the average cost of setting up a telephone loop from the switch to the customer is higher.

As the reader will note, the average cost to add a new telephone loop is much higher in the study area than in other parts of the country.[15] These higher costs can also be illustrated by examining the population density of counties in Missouri in Figure 3 where the study area counties have been hatched. The dark green counties have population densities up to 25 people/sq. mile—a density level roughly equal to the 25th percentile of the contiguous US, i.e. the lower 48 states. The light green counties are between 25 and 50 people/sq. mile while the yellow is between 50 to 100 people/sq. mile. The counties in yellow have a lower population density than the contiguous US. The orange counties represent population densities from 100 to 1,000 people/sq. mile, while the red counties have densities over 1,000 people/sq. mile. Figure 3 illustrates that most of the population in Missouri is concentrated in St. Louis and Kansas City. The rest of the state has a lower population density.

Figures 4 and 5 show how wages and the population have changed for the study area since the 2000 census. Compound Annual Growth Rate (CAGR) in real wages for Missouri, and for the study area in particular, has not been very high. [16] The counties in the target area have seen wages grow at a 0.99% annual rate after adjusted for inflation. Furthermore, not only do the counties in the study area have a low customer density, but the population density of these counties has been decreasing over the past 10 years. Of the 8 counties, 75% of them lost population from the 2000 Census with an average population decrease of -6% among the counties to lose population. This loss is greater than the 24% of Missouri counties to lose population which were not in the study area. These counties had an average population loss of -3.7%.[17]

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[15] Assume for the sake of argument that it costs a phone company $1,000 to add a new 1 mile loop regardless of the location of the loop and that the phone company is allowed to charge these new customers the average cost of the loop. Assuming one phone line per household and 2.5 people per household, the ILEC in Manhattan will have 28,380 new customers. This breaks down to an average charge to each household of 3.5 cents. However, CVTC will have 1.6 new customers whereby it must charge $625 per customer to recover the cost of the new loop.

[16] The compound annual growth rate is determined by the following formula: {[(Ending value/Beginning value)]^(1/# of years)] -1}

[17] Author's calculations based upon US Census Bureau population data. http://www.census.gov/popest/estimates.html

These two issues, *1)* the low population density combined with declining population, and *2)* below average wages combined with very slow wage growth, means that the costs to provide telephone and internet access in these counties will *increase* over time—*not decrease* as the FCC believes.[18] Therefore, the FCC's proposed changes to USF and ICC will require Chariton Valley to increase revenues from customers by raising rates, *i.e. increase consumer's costs*, adding customers, or developing new lines of business or services that will pay for the CVTC network. These propositions are difficult, if not impossible, to accomplish in rural Missouri. The basis for the FCC's proposal to redirect USF and ICC is to improve efficiency. Yet, in rural Missouri the FCC proposal would make it more difficult and more costly to provide comparable telephone and broadband, which would incentivize customers to drop off the network. Having fewer households paying more per month for phone and internet service are two things the FCC has stated it does *not* want.

Data and Methodology

Annual projected revenues from USF and ICC assuming no change in FCC proposals was provided by CVTC for the years 2012 to 2020. These revenues were projected to decline over the next 9 years for a variety of reasons some of which included: a 4% yearly decline in subscribers; a 20% per year decline in High Cost Loop Support; and a 4% decline in Minutes of Use (MOU) which would decrease Interstate and Intrastate Carrier Compensation. Therefore, even with no change in FCC reforms and policies, CVTC will be facing revenue declines in the coming years making the provision of phone and broadband service more difficult. Against this backdrop, revenues after the FCC proposed USF and ICC reforms were calculated and subtracted from the baseline revenue projections to create a consolidated yearly revenue loss. These post FCC reform revenue projections were broken up into two different scenarios. The first being the standard FCC proposed reforms. The second scenario included a projected decline in Connect America Fund (CAF) support to zero dollars after July 1, 2014. Therefore, the projected revenue declines are identical in scenarios 1 and 2 until 2014 where they begin to diverge from each other due to changes in the assumptions about the continuation of CAF dollars.

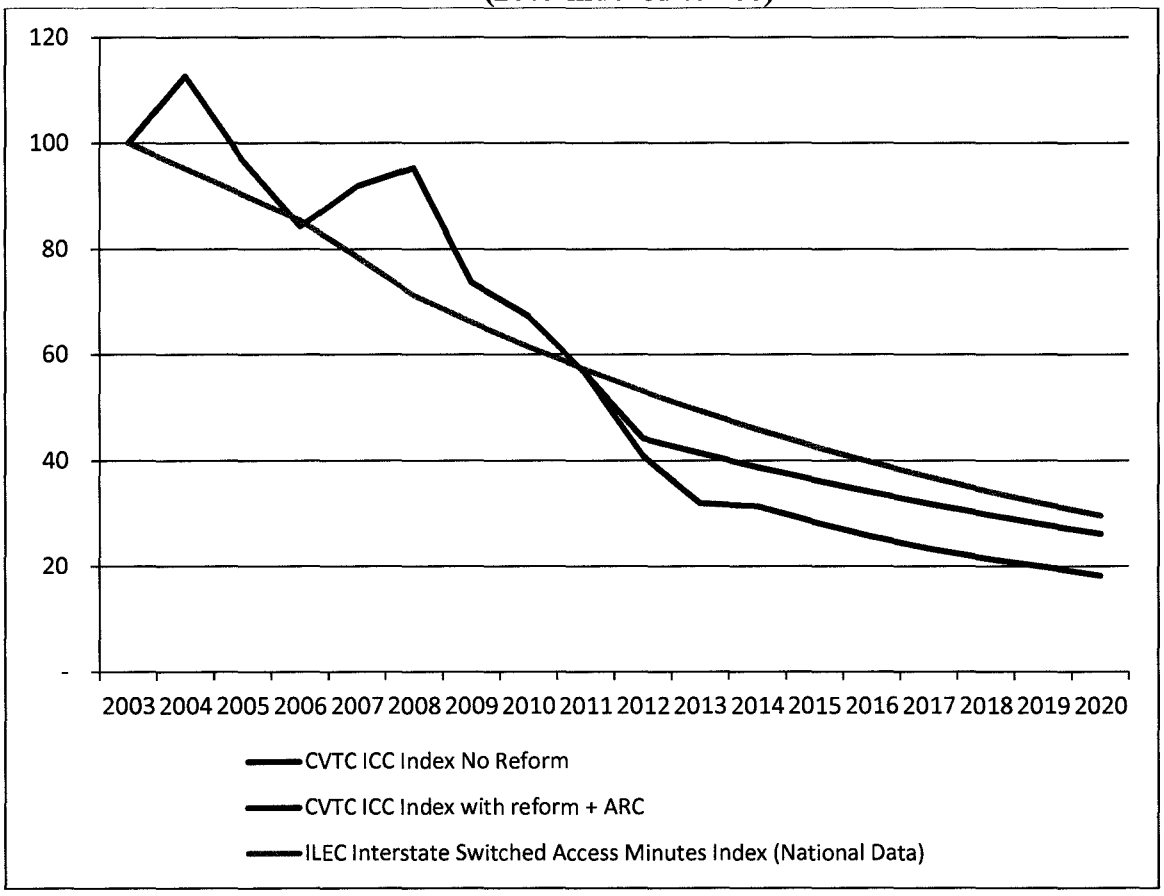
Figure 6 shows ICC revenue for CVTC under, a) baseline scenario of no FCC reform, b) proposed FCC reform scenario 1 with an Access Recovery Charge (ARC), and c) national ILEC data on interstate switched access minutes.[19] Future national interstate switched access minutes accruing to ILECs were forecasted and regression analysis showed that interstate switched access minutes have been declining at a rate of -7.056% per year since 2000. Past ICC revenue data from CVTC was then converted into 2012

[18] *FNPRM*, FCC, 11-161 (rel. Nov. 18, 2011), ¶ 861.

[19] Switched access minutes are used as a basis for determining interstate intercarrier compensation. The national data is from FCC, "Trends in Telephone Service" September 2010.

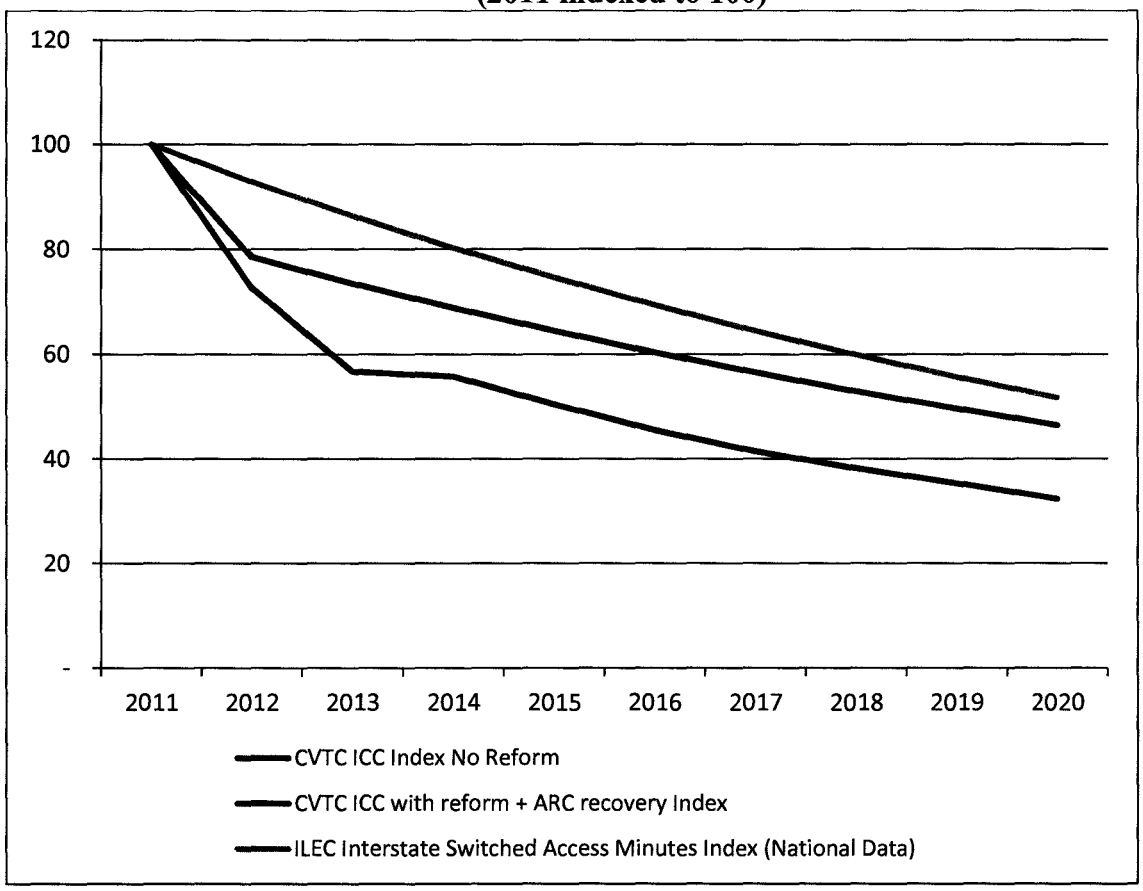
dollars to account for inflation while inflation for future years (2012-2020) was forecasted to be 2.5% per year. It should be noted that all of the revenue data in Figure 6 was converted into an index where real revenue in 2003 was set equal to 100. This was to make comparisons between the baseline scenario and scenario 1 simpler to see and to protect proprietary company data.

Figure 6. ICC Real Revenue Index from 2003-2020 (2003 indexed to 100)



As the reader will note, CVTC will experience large declines in ICC over the next several years. Even with an ARC fee proposed by the FCC to supplant intercarrier compensation, ICC will fall to less than $1/5^{th}$ of the value it had in 2003. Figure 7 'zooms in' on Figure 6 and considers projected ICC revenues from 2011 to 2020. Once again, these have been indexed, except now they are indexed to 2011 (2011=100). With the proposed FCC changes to ICC under scenario 1, CVTC can expect revenue from intercarrier compensation to decline 68% in 2020 from its 2011 level.

Figure 7. ICC Real Revenue Index from 2011 to 2020
(2011 indexed to 100)



The negative impact to CVTC is worse under scenario 2 with CAF funding set equal to $0 in 2014. Figures 8 and 9 compare CVTC ICC revenue under conditions of no reform to scenario 2 using the same time frames and indices as in Figures 6 and 7. Under scenario 2, where the FCC removes CAF in 2014, ICC revenues will fall almost *95%(!)* from their 2003 value. An alternative way to examine the impact of scenario 2 on CVTC revenues is through Figure 9 where we see that ICC revenues will fall by nearly 91% between 2011 and 2020. Under either scenario the revenues CVTC needs to maintain its network and provide services will fall dramatically. Due to the spatial and income characteristics of the population it serves, CVTC has no real prospects of recovering this lost revenue. The probable result will be declines in services to its customers, layoffs of employees, decreases in future upgrades and investments in phone, wireless, and broadband capabilities, and rate increases to its rural customer base.

Figure 8. ICC Real Revenue Index from 2003 to 2020
(2003 indexed to 100)

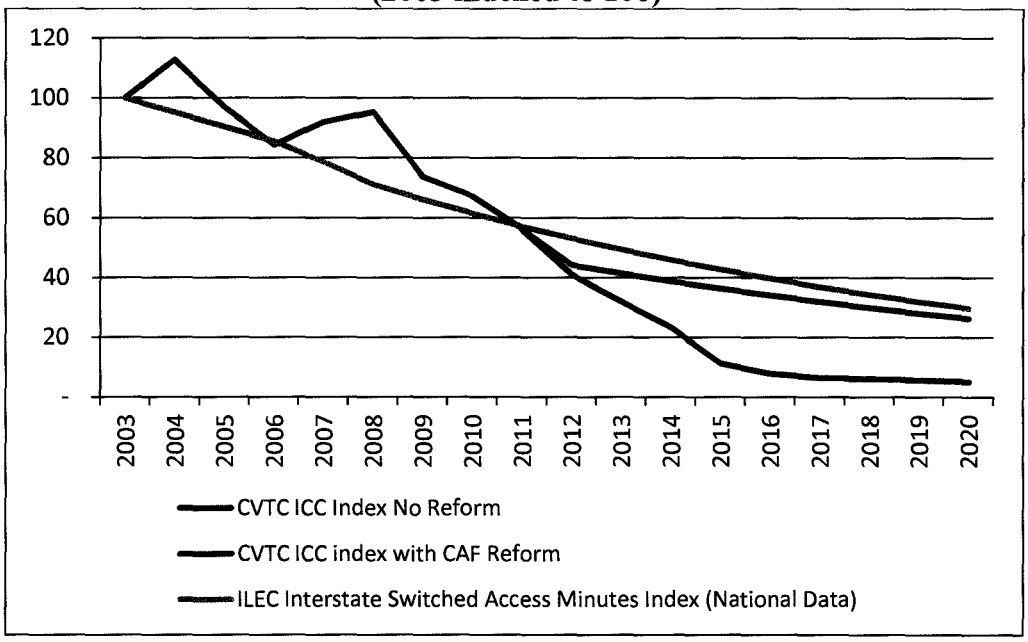
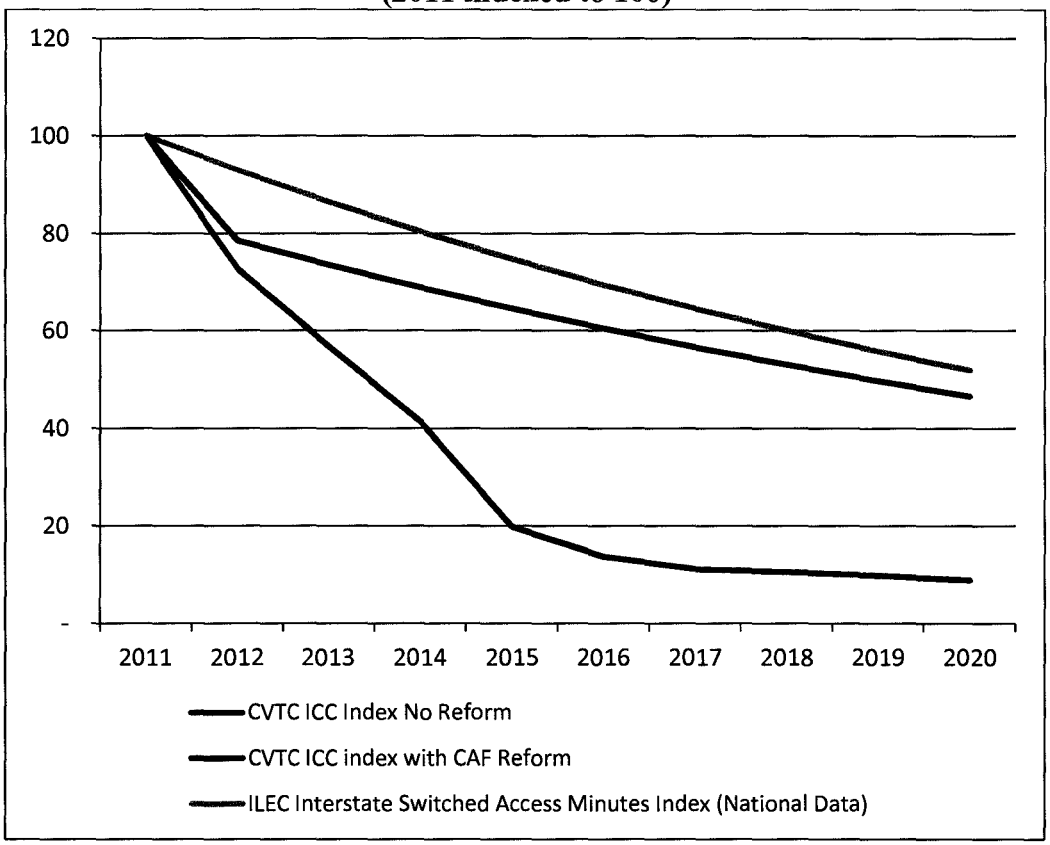


Figure 9. ICC Real Revenue Index from 2011 to 2020
(2011 indexed to 100)



There are similar results when examining USF revenue reductions. As with ICC revenues, future decreases in USF revenues were estimated and interlaced with current USF revenues. These were converted into real 2012 dollars to remove any impacts from inflation and then indexed so that 2011 funding levels were set equal to 100. Figure 10 illustrates what USF revenue reductions CVTC can expect over the next 9 years. USF revenues will sharply decrease every year with the largest declines occurring from 2012 to 2014. Beginning in 2015, there will continue to be yearly declines in USF revenues, but this rate of decline will begin to abate. Nevertheless, by 2015, USF revenues will be down 23% compared to their 2011 level. By 2020 revenues will have decreased 31% from their 2011 level. These declines in USF funding will be identical under either of the FCC scenarios that were examined with ICC.

Figure 10. USF Real Revenue Index from 2011 to 2020 (2011 Indexed to 100)

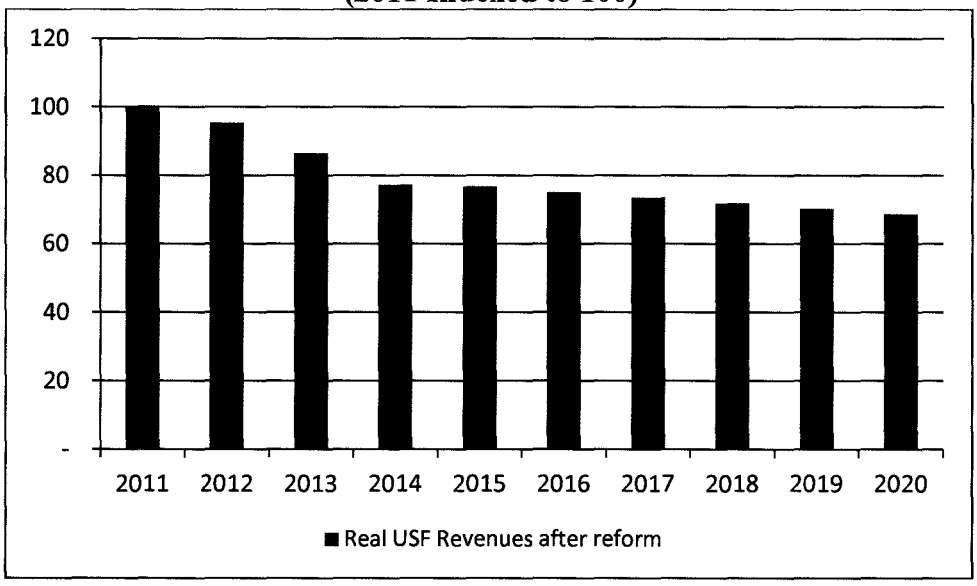
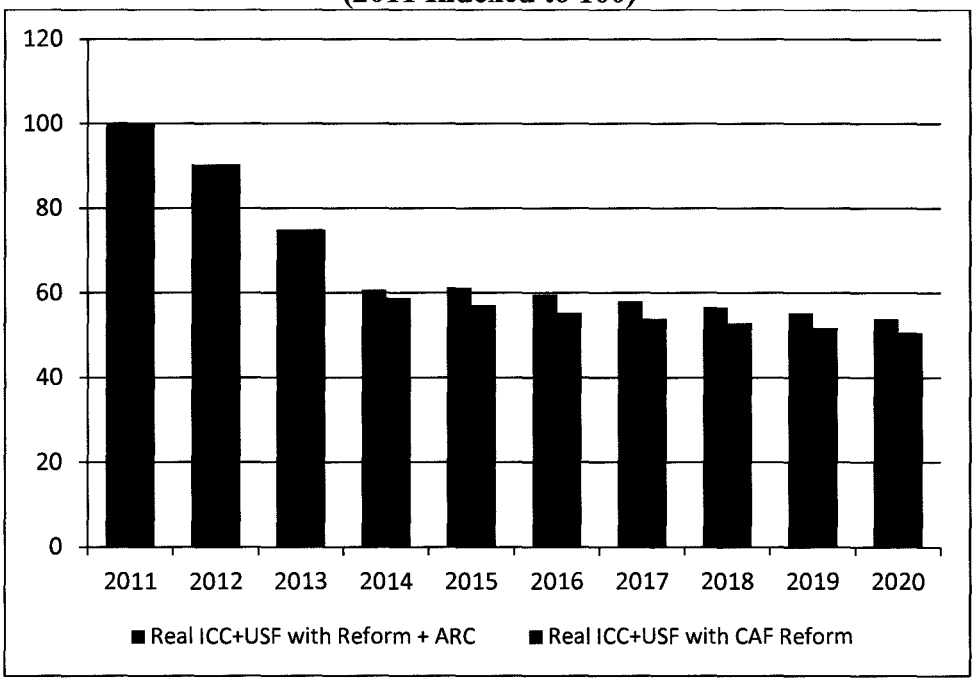


Figure 11 combines the inflation adjusted declines in USF and ICC funding from both of the different scenarios and indexes the 2011 USF and ICC total revenues at 100. As past analysis has shown, the majority of the yearly decline will occur between now and 2014 with the rate of decrease in revenues slowing from 2015 to 2020. By 2020, USF and ICC revenues will have fallen between 46% and 50% depending upon whether the FCC stops CAF funding in 2014 or not.

Up until this point, these revenue reduction scenarios have assumed that customers would not leave CVTC due to rate increases necessitated by the FCC Order—i.e., that there would be no subscriber substitution for wireless or wireline phone service. The Access Recovery Fee allows CVTC to 'compensate' itself for the loss of ICC by charging an 'access fee' on subscribers. In short it is a method of raising costs to consumers. Recall that under current FCC stipulations, the ARC is limited to increases of

Figure 11. Real USF and ICC Revenue Index from 2011 to 2020 (2011 Indexed to 100)



$0.50 per month per year that will raise the cost of phone service to current CVTC customers. Under current guidelines this means that CVTC will increase the price of wireline phone service by almost 38% by 2020 compared to 2012. Evidence suggests that the price elasticity of consumers for phone service is -0.46 while the cross-price elasticity is 0.3.[20] In other words, for every 10% increase in price from the ARC that CVTC uses to offset the decrease in USF and ICC funds, they will lose 7.6% of their customers. Approximately 3% will substitute mobile-only phone service for wireline phone service and 4.6% will simply cease to have phone service at all.[21]

To determine how big of an impact the ARC would have on CVTC customers, the price for local telephone service and the basic nationwide wireless service was determined from CVTC.[22] This was combined with the current number of subscribers to determine total revenue from basic phone and wireless services. Other data from CVTC allowed for the estimation of ancillary revenues from providing wireline and wireless

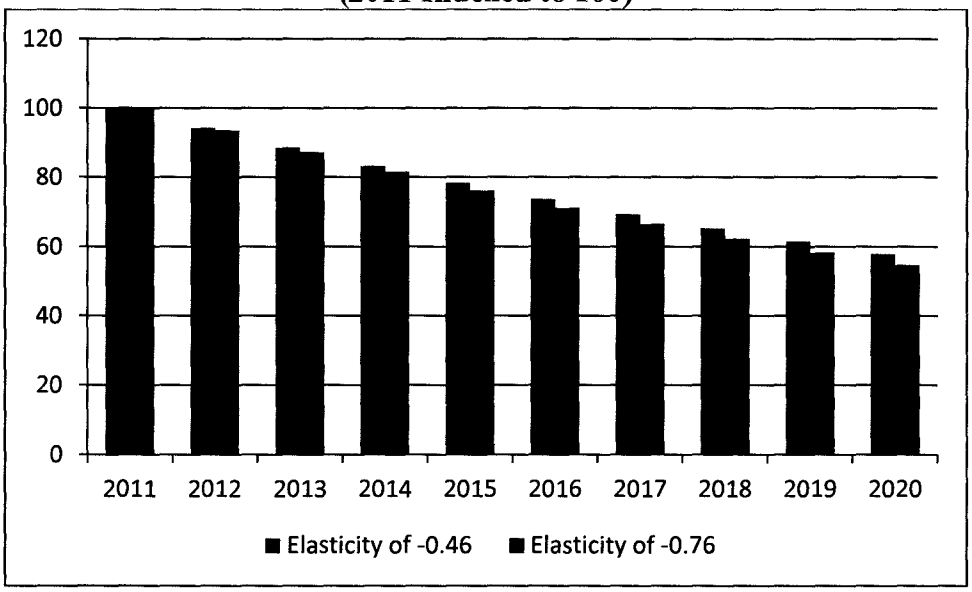
[20] Train, K., McFadden, D. and Ben-Akiva, M. "The Demand for Local Phone Service: A Fully Discrete Model of Residential Calling Patterns and Service Choices." *RAND Journal of Economics*, Vol. 18 (1987), pp. 109-123.
Ward, M. and Woroch, G. "The Effects of Prices on Fixed and Mobile Telephone Penetration: Using Price Subsidies as Natural Experiments." *Information Economics and Policy*, Vol. 22 (2010), pp. 18-32.

[21] The extent to which consumers will substitute away from landline phone service and toward mobile phone-only service is a function of the quality of the mobile network in the area. If the mobile network is low quality, e.g. lots of 'dead spots,' then there will be less substitution and the impact will not be as large. Determining the quality of alternative mobile-only phone service in the service area was beyond the scope of this project.

[22] http://www.cvalley.net/products-and-services/telephone and http://www.cvalley.net/wireless

service.[23] Then the ARC was added to the price of phone service and the elasticity estimates of -0.46 and -0.76 were used to determine how many subscribers CVTC would lose with each yearly increase in the ARC.[24] The yearly decrease in customers not only lowers revenue for basic phone and wireless services, but also decreases revenue from the ancillary services. Figure 12 shows these revenue changes in real dollars indexed to 2011. By 2020, CVTC could face real revenue declines of approximately 43% to 46%. Once again, these revenue decreases are a direct result of the decrease in subscribers that CVTC is likely to face as they assess the ARC fee—a fee that the FCC believes will have little negative impact on rural ILECs.[25]

Figure 12. Real Wireline and Wireless Revenues with Consumer Substitution (2011 Indexed to 100)



The decreases in yearly revenue that will accrue to CVTC from declines in USF, ICC, and other subscriber revenue was combined to determine the economic impact on the local area of the FCC's plans. It was assumed that CVTC would respond to the decrease in revenues by attempting to reduce costs. These costs reductions will take the form of reductions in the number of employees and in reductions in new investments in plant and equipment. Internal data on CVTC revenue, new investment, and employment was then analyzed to determine how much new investment and employment would

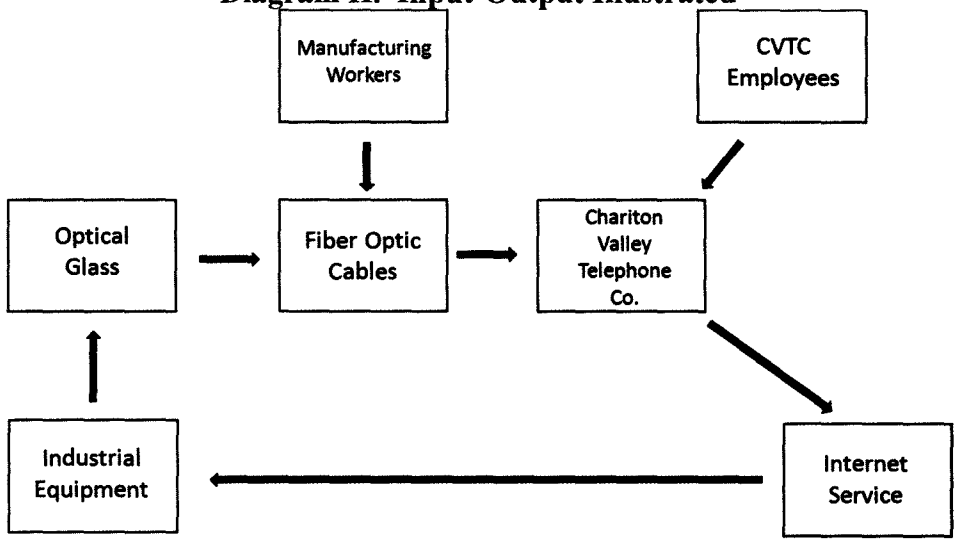
[23] This would include charges for long distance, directory listings, texting, data plans, etc.
[24] It is unknown how many current CVTC wireline subscribers would switch to CVTC wireless services or would switch to wireless services from another provider. Having a customer switch from CVTC wireline to CVTC wireless might have a very small impact on revenues (or even make them go up). On the other hand, if a customer cancelled their wireline service and switched to another provider's wireless service, the impact on CVTC revenues would be larger. The elasticity estimate of -0.46 and -0.76 provides a 'lower bounds estimate' of the impact of ARC on revenues.
[25] *FNPRM*, FCC, 11-161 (rel. Nov. 18, 2011).

decrease per dollar of revenue decrease.[26] This allows one to determine how many employees CVTC would be forced to let go, and how much new investment in plant and equipment would decrease, for the stated changes in revenues. It was further assumed that there would be no change in the quality of phone service in the *short run*. However, in the *long run*, declines in new investment today are likely to adversely impact the quality of phone and currently offered broadband service. What economic impact this long run decline in quality would cause was not analyzed as it was beyond the scope of this project.

Input-Output Analysis

A county level Input-Output (IO) model was developed and implemented using IMPLAN[27] to trace the economic impacts of the two different FCC scenarios: a) reductions in USF and ICC with ARC; and b) reductions in USF and ICC with CAF at zero dollars in 2014. Input-Output analysis assumes that in order for the economy of a region (such as a state or county) to generate output, it requires inputs. These inter-industry linkages between different industries are traced, compiled, and then aggregated to understand the backward and forward flow of economic activity within the region. Therefore when there is an increase in demand for the output of industry Z, it requires inputs from industries X and Y in order to make this additional output. Of course the outputs from industry X and Y, which are inputs for industry Z, also require inputs. Diagram II illustrates the concept more clearly.

Diagram II. Input-Output Illustrated



[26] Company revenue, investment, and employment data are considered proprietary and are not reported; nor is the amount of new investment per dollar of revenue, etc. If these numbers were reported, one could easily use the data in this report and, working backwards, determine company revenues, employment, and investment. It should be noted that CVTC data closely matched, but was not identical to, national data.

[27] IMPLAN is a software package that is used in Input-Output analysis to determine the size and nature of economic shocks using a classification system of 509 different sub-sectors of the economy

As the reader can see, firms such as *Stemmerich, Inc.* of St. Louis, Missouri, produce optical glass as an output. This optical glass is an input to *Connection Concepts, Inc.* of Bridgeton, Missouri. *Connection Concepts, Inc.* combines the optical glass purchased from *Stemmerich, Inc.* and, using workers in Missouri, creates fiber-optic cables. These fiber optic cables, combined with employees of *CVTC*, are inputs into the production of broadband internet service—an output of CVTC. Finally, internet service is used as an input by a company such as *Berglund Distributing Co. & Manufacturing* of Macon, Missouri, which manufactures and distributes industrial machinery and equipment that was needed by *Stemmerich, Inc.* to create optical glass.[28]

As Diagram II shows, IO modeling creates a useful framework for identifying how changes in one industry can impact other industries. For example, a decrease in funds used to provide phone and internet service reduces the amount of fiber optic and phone cables needed, along with phone company employees, by CVTC to provide telecommunications services. However, since there is less demand for fiber optic and phone cables, the companies producing them require fewer employees and less optical glass. This leads to further layoffs and less purchasing of inputs in the optical glass industry. IO modeling allows the researcher to trace all of these changes, both forward in the production process and backwards in the production process, and determine their aggregate impact.

The impacts from changes in economic activity are divided up into three different parts: direct effects, indirect effects, and induced effects. An example will help to clarify the different impacts. Suppose that a new golf course is to be built in Kansas City, Missouri. The actual construction and operation of the golf course would generate direct effects which would be associated with the direct purchase of inputs used in the production of golf games. These purchases can be from people in the area or visitors to the area.

The economic impact does not stop with the direct impact, as it has a ripple effect on other industries and households in the form of induced and indirect effects. For purposes of classification, the indirect effects are the increased use of inputs that are produced by other firms that are needed to meet the increased initial demands. The induced effects are created from the additional income generated and spent by households and business from the direct and indirect effects. Returning to the golf course example, the indirect effects could be in the form of increased commerce for local landscaping businesses that would plant and maintain the golf course. This generates additional income for the employees of the golf course and the landscaping company, who then purchase movie tickets, haircuts, restaurant meals, and other assorted goods and services

[28] The companies listed here, and their products, are real companies located in Missouri. However, this is meant as an illustration of how IO modeling works and should not be construed as an actual list of suppliers within the supply chain.

which further generates additional income and consumption spending by these companies and their employees. This final effect is the induced effect.

Results

The results are presented in Tables 2 and 3. Since reporting direct effects would allow one to work backwards and determine proprietary company data only total effects, i.e. direct+indirect+induced, are reported. Table 2 shows what the economic impact on the state of Missouri from scenario 1. Under this scenario, USF and ICC are reduced along their currently prescribed schedule and CVTC implements ARC to recover some of these reductions in ICC. The gains in CVTC revenue from implementing ARC will not fully compensate for the reductions in ICC. Furthermore, scenario 1 assumes that subscribers will respond to the higher prices by either dropping phone service or switch to wireless only service from another provider. Accounting for the decrease in subscribership magnifies the revenue declines from USF and ICC reductions and also makes the analysis more realistic. The revenue declines are forecasted out till 2020.

With the decline in USF and ICC revenue, CVTC will be forced to lay off employees and decrease its purchase of capital goods. This will mean a decrease in the output of firms who supply CVTC with their capital goods. For example, as CVTC decreases its investment in new plant it will purchase less fiber optic and other communications equipment. These declines are substantial and average 85% per year over the time frame under study. Therefore there will be a decrease in demand for the output produced by the fiber optic and equipment manufacturers. As these firms see decreases in their output, they will respond by either reducing their workforce or going out of business. As these workers see their wages reduced, they will decrease their spending on other things such as cars, gasoline, food, clothes, entertainment, etc. This will negatively impact the firms in these industries as well, leading to further employment cutbacks and wage reductions. Therefore, the initial (direct) impact of the reduction in CVTC's revenues is multiplied throughout the entire economy to influence other industries. This is the total measure listed in Table 2. It should be noted that the impact on industries outside of Missouri was not considered—in other words, this model only looks at the impacts on the state of Missouri itself. The actual effect on the nation as a whole will be larger.

Although the categories of employment and wages are fairly straight forward, the two columns on output merit further explanation. The output generated is a reflection of 'total' output and includes the value of intermediate inputs. The value of intermediate inputs are not calculated in Gross State Product (the state level equivalent on Gross National Product), therefore, the reader cannot interpret the output measures as a change in gross state product. They are a reflection of the value of the intermediate inputs and the final goods and services produced by the firms as a result of the spending patterns by

CVTC. For example, suppose that there is an economic shock that results in one more car being produced. Suppose that Ford must pay $2,000 for the steel needed to make the car and that once completed, the car will sell for $10,000. Examining total output will add up the value of these transactions so that one can see how much money is 'changing hands.' The column labeled 'Total Value Added' would be the impact on gross state product which is equivalent to Gross Domestic Product (GDP).

Examination of Table 2 illustrates the impacts of FCC policy concerning the USF and ICC program in Missouri. The state can expect a decline of over 155 jobs over the study period with a decrease of $9 million in wages over this same period. Total state output will decline by over $34 million dollars while tax revenues will decrease by over $4 million over the same period.

These disconcerting impacts are smaller than the total effects of the FCC's actions under scenario 2. Recall that under scenario 2 there is a withdrawal of CAF funds after July 1, 2014, in addition to the USF and ICC reductions. Therefore, the effects under scenario 1 and 2 are identical until 2014. After this point, the revenue and subscribership reductions become larger than they were under scenario 1. Now we see that the state will lose 187 jobs and see total wages reduced by almost $1 million over the study period. Meanwhile, state output will fall by over $40.9 million and the taxes will be reduced by over $4.8 million.

The economic impacts on Missouri reported in this study were measured from only *one firm* impacted by the changes ordered by the FCC.

Table 2. Economic Impact from FCC Scenario 1
(Reductions in USF, ICC, with ARC)

Year	Total Employment	Total Wages	Total Value Added	Total Output	Federal Taxes	S&L Taxes
2012	-4.7	-258,687	-536,584	-961,483	-57,799	-55,136
2013	-6.5	-843,254	-1,757,656	-3,146,107	-189,003	-181,187
2014	-23.3	-1,219,125	-2,704,924	-4,837,906	-290,498	-279,486
2015	-21.3	-1,179,448	-2,477,263	-4,426,757	-265,664	-256,647
2016	-20.9	-1,160,788	-2,488,628	-4,371,471	-262,193	-254,392
2017	-20.3	-1,132.308	-2,397,286	-4276,420	-256,365	-249,643
2018	-19.8	-1,101,561	-2,341,243	-4,172,946	-250,032	-244,413
2019	-19.2	-1,070,861	-2,284,657	-4,068,752	-243,665	-239,083
2020	-18.7	-1,044,379	-2,236,472	-3,979,747	-283,216	-234,591
Total	**-154.7**	**-9,010,411**	**-19,224,713**	**-34,241,589**	**-2,053,435**	**-1,994,578**

Table 3. Economic Impact from FCC Scenario 2
(Reductions in USF, ICC, with CAF=$0 after 2014)

Year	Total Employment	Total Wages	Total Value Added	Total Output	Federal Taxes	S&L Taxes
2012	-4.7	-258,687	-536,584	-961,483	-57,799	-55,136
2013	-6.5	-843,254	-1,757,656	-3,146,107	-189,003	-181,187
2014	-26.3	-1,457,705	-3,049,187	-5,453,638	-327,470	-315,055
2015	-27.6	-1,528,330	-3,210,041	-5,736,197	-344,247	-332,464
2016	-20.9	-1,160,788	-2,448,628	-4,371,471	-262,193	-254,392
2017	-26.7	-1,483,159	-3,140,096	-5,601,489	-335,802	-326,997
2018	-25.6	-1,424,737	-3,028,116	-5,397,204	-323,386	-316,117
2019	-24.6	-1,371,438	-2,925,930	-5,210,796	-312,059	-306,189
2020	-23.7	-1,323,461	-2,834,108	-5,043,226	-301,873	-297,280
Total	**-186.6**	**-10,881,559**	**-22,930,346**	**-40,921,611**	**-2,453,832**	**-2,384,817**

Figure 1. Chariton Valley Service Area

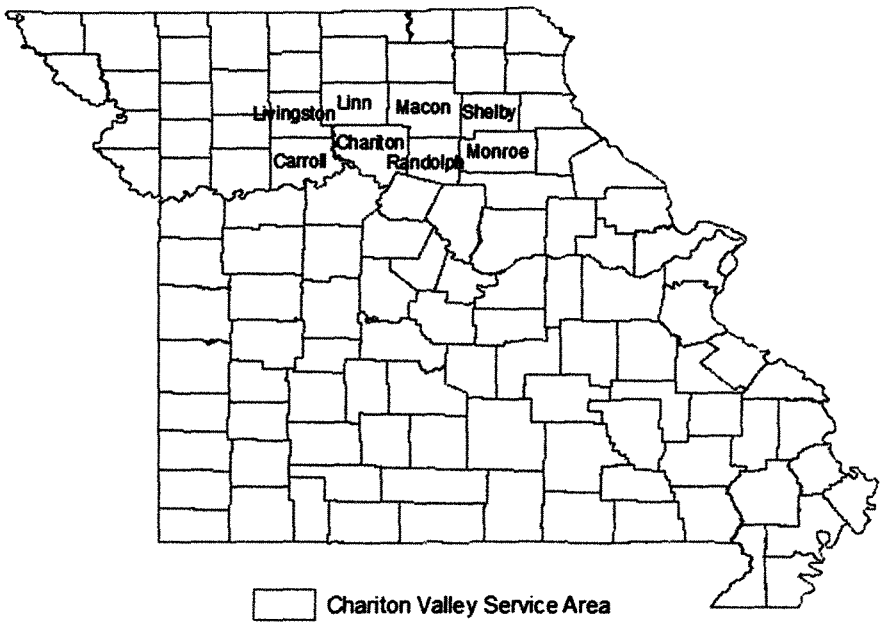


Figure 2. Average Weekly Wages

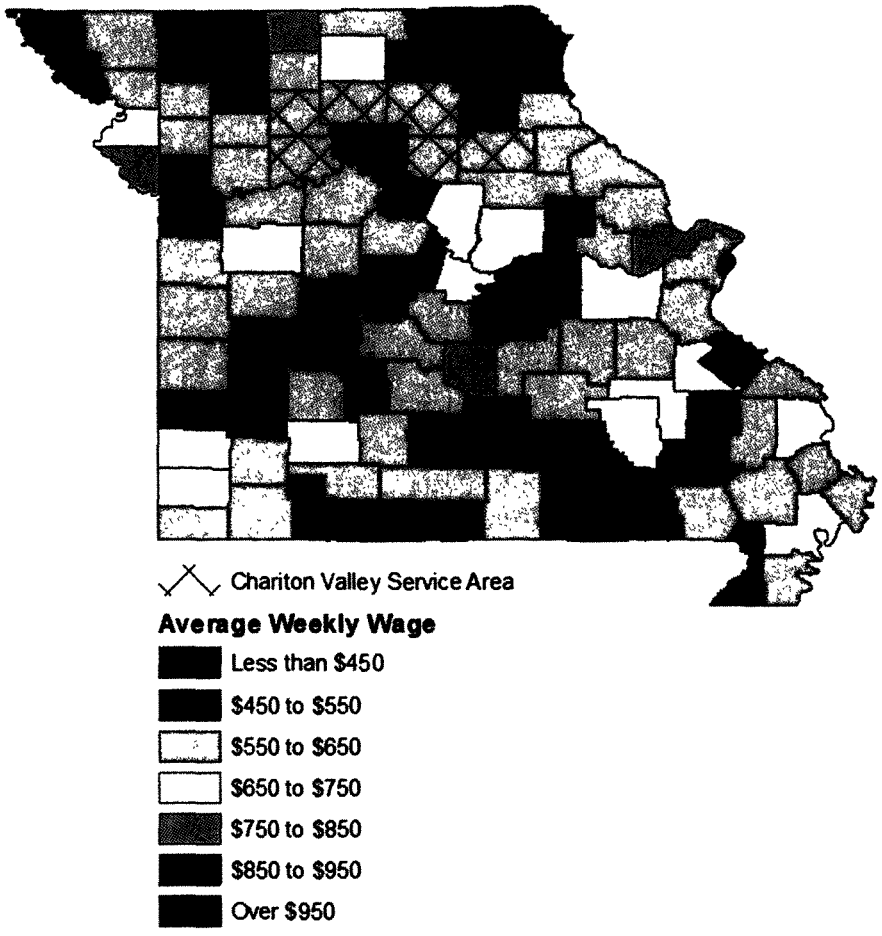


Figure 3. County Level Population Density

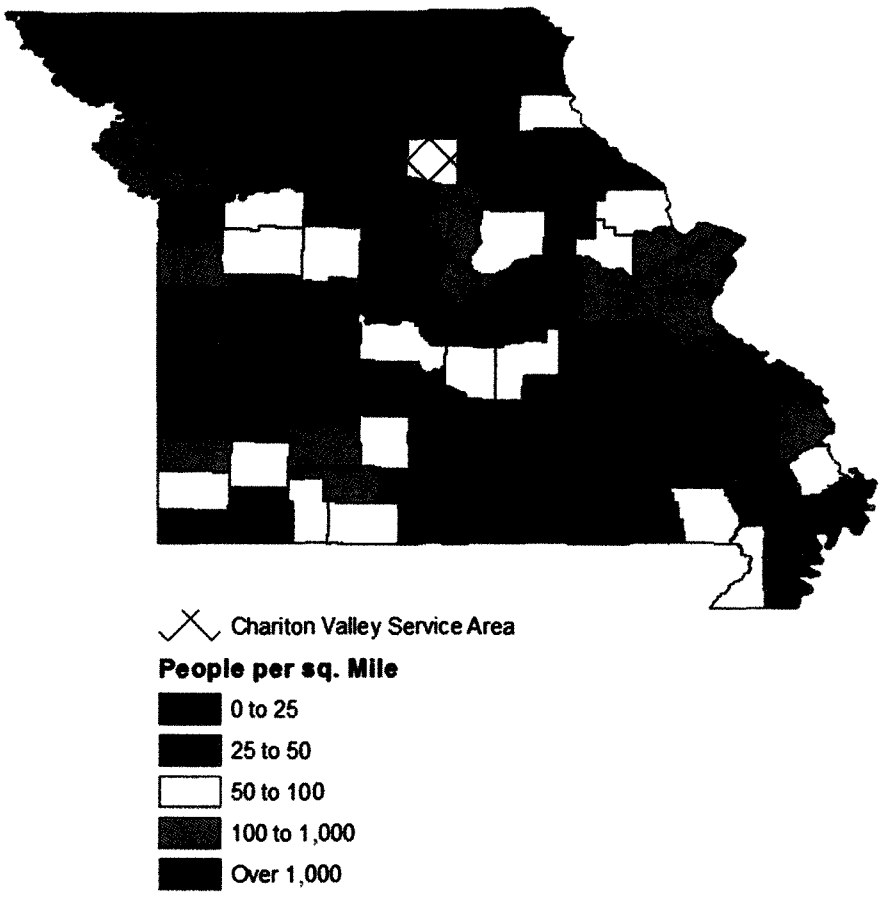


Figure 4. Compound Average Growth Rate in Real Wages (2000 to 2010)

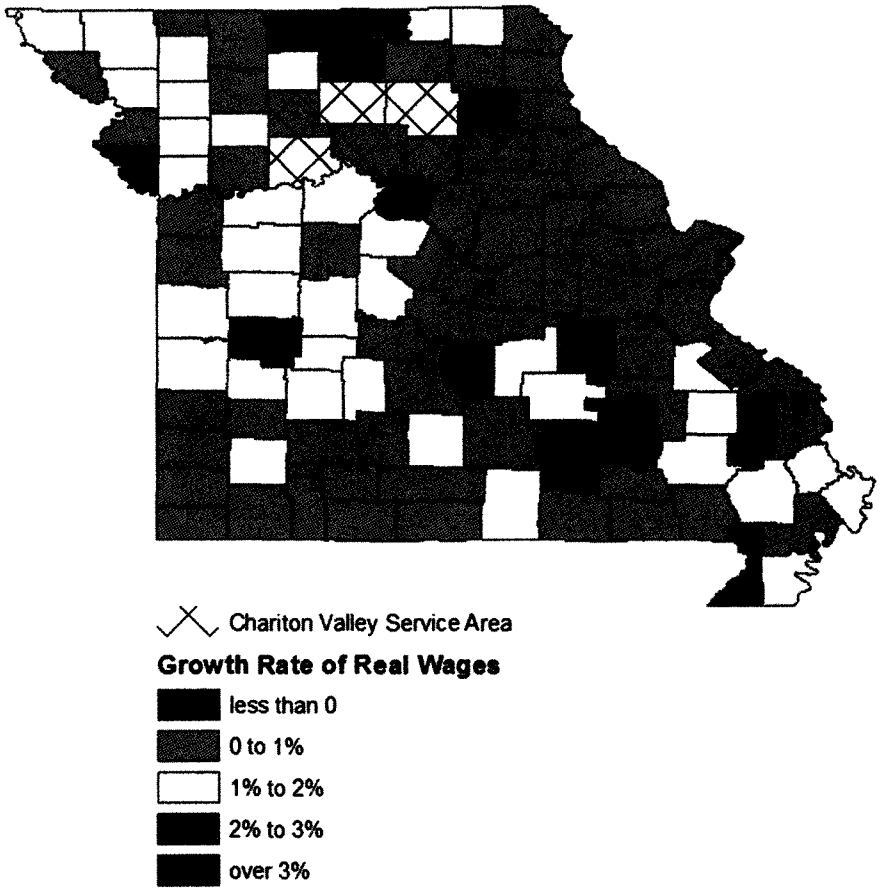


Figure 5. Percent Change in Population (2000 to 2010)